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Title	Metallic Paint and a Method for Painting Therefor
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Abstract

[Purpose] To develop metallic paint that can form a medium-toned and strongly brightening coating film and a method for painting therefor.

[Constitution] Metallic paint prepared by using glass flakes coated in multi-layers with silver and nickel as metallic pigment and a method for painting therefor.

Claims

1. Metallic paint comprising scaly particles prepared by coating the surface of glass flakes in multi-layers with silver and nickel in this order as metallic pigment.

2. A method for metallic painting comprising painting

with metallic paint followed by painting with clear paint on the painted surface, wherein the metallic pigment in said metallic paint is of scaly particles prepared by coating the surface of glass flakes in multi-layers with silver and nickel in this order.

Detailed Description of the Invention

[Industrial Field of Application]

The present invention relates to novel metallic paint and a method for painting therefor.

[Prior Art and Problems to be solved]

Coating films formed with metallic paint display varied and very beautiful characteristic appearance coupled with various color tones on the films, since scaly metallic pigments contained in said films reflect the light from the outside to glitter. Thus, the metallic paint has been applied much, particularly to the shell plate of cars or motorcycles.

The following metallic pigments have long been used in many cases: scaly aluminum powder; mica particles coated with metal oxides such as titanium oxide or iron oxide; graphite particles; iron oxide particles mainly containing crystalline particles of α-iron oxide; and the like. However, though these metallic pigments have normal brightness (brightening impression), it has been desired to develop metallic coating films displaying much stronger brightness as the brightness

of the so far used pigments is insufficient. In this connection, among these pigments, there is another problem that highly brightening iron oxide has high specific gravity to easily deposit in the paint.

[Means for Solving the Problems]

The purpose of the invention is to develop metallic paint and a method for painting therefor which can display strong brightness and in which all of the above-mentioned defects are removed. As a result of diligent studies, it was found that the above purpose could be attained by use of glass flakes coated in multi-layers with silver and nickel as metallic pigments. The invention was completed based on these findings.

More particularly, the present invention relates to (1) metallic paint that comprises scaly particles prepared by coating the surface of glass flakes in multi-layers with silver and nickel in this order as metallic pigment; and (2) a method for metallic painting which comprises painting with metallic paint followed by painting with clear paint on the painted surface, wherein the metallic pigment in said metallic paint is of scaly particles prepared by coating the surface of glass flakes in multi-layers with silver and nickel in this order.

The metallic paint of the present invention is liquid paint comprising as main components a specific metallic pigment, a vehicle component and a solvent, and if required further containing a color pigment.

The metallic pigments used in the present invention are brightening pigments prepared by coating the surface of glass flakes in multi-layers with silver and nickel in this order. Specifically, said pigments may be produced by first coating the surface of glass flakes as cores with silver, and then coating the resulting silver surface with nickel. That is, said pigments have a silver layer and a nickel layer on the surface of glass flakes. The glass flakes as cores are scaly glass particles, of which the size is preferably 5-40μ in the long axis and the thickness is 1/5 to 1/20 as small as the long axis. In some cases, the glass flakes may contain a small amount of ZnO, B_2O_2 and other components in addition to SiO_2 as their main ingredient. As a method for coating the surface of said glass flakes with silver, a non-electrolytic plating method is appropriate. The coating amount is preferably 0.01 - 0.3μ, particularly 0.02 - 0.3μ, depending on the thickness of silver film. Silver used in coating is preferably pure one, but not limited thereto. As for a method for further coating the silver surface on the glass flakes with nickel, the same method as mentioned in that for silver including the amount for coating can be applied except that nickel is used in place of silver. Nickel used in coating is preferably pure one, but not limited thereto. Thus multi-coated glass flakes are preferably subjected to surface finishing in an appropriate operation.

As a vehicle component, it is appropriate to use a

composition of corsslinking curing resin composition containing a basic resin and a crosslinking agent as main components. The basic resin includes acryl resins, polyester resins or alkide resins having crosslinking functional groups. The crosslinking agents include, preferably, methylol-attached and/or alkyl etherated melamine resins or urea resins, and polyisocyanate compounds (including block compounds). Also used are self-curing resins and thermoplastic resins.

As a solvent, an organic solvent for painting and/or water can be used.

In the present invention, the blending ratio of the glass flakes (metallic pigments) coated with nickel, etc., is preferably 0.1 - 30 parts by weight for 100 parts by weight of the vehicle component (solid component).

In addition of the above-mentioned respective components in the metallic paint of the present invention, if required, one or more pigments selected from coloring pigments, other metallic pigments (for example, aluminum pigment, iron oxide pigment, etc.) and interference color pigments (for example, mica, mica coated with metal oxide, etc.) may be blended therein as far as they do not damage the metallic impression of the above-mentioned pigments of glass flakes coated with nickel and the like.

The form of the metallic paint of the present invention may be of organic solvent type, high solid type, non-aqueous

dispersion type, aqueous solution type, or aqueous dispersion type. These may be prepared in the known methods.

The method for metallic painting of the present invention comprises painting with metallic paint followed by painting with clear paint on the painted surface.

The clear paint is composed of a basic resin and a crosslinking agent as main components, if required containing an organic solvent, water, pigments, etc., which is used in forming a transparent film, and the *per se* known paint may be used.

As the basic resin in the clear paint, those excellent in weather resistance, smoothness, brightness, etc., are preferably used, for example, including acrylic resins, polyester resins, alkide resins and fluororesins. These have preferably a functional group (e.g., hydroxyl group, carboxyl group, epoxy group, glycydyl group) reacting with the crosslinking agent. The crosslinking agent reacts with said basic resin to harden forming a three-dimensional crosslinking structure. Such agent specifically includes methylol-attached and/or alkyl etherated melamine resins or urea resins, and polyisocyanate compounds (including block compounds).

The clear paint may contain a color pigment in such an amount that does not decrease transparency. Though its form may be of powder type, a liquid form using an organic solvent

and/or water as solvent is preferred.

The method of painting of the present invention is characterized by comprising painting with metallic paint followed by painting with clear paint.

The painted object (for example, metal or plastic) is if required subjected to surface finishing, primer coating and intermediate coating, and then the above-mentioned metallic paint is applied thereto. There is no limitation in the thickness of coated film, and the thickness is preferably fixed in 10 - 30μ based on the cured film. The resulting metallic film is cured at a temperature from ambient temperature to 160°C, and then or without curing the above-mentioned clear paint is coated on the painted surface. The clear paint film is preferably fixed in 20 - 100μ based on the cured film. After coating of the clear paint, the hardening is preferably carried out at a temperature from usual temperature to 160°C. The clear film may be of mono layer or if required dual or multiple layers.

Thus resulting metallic film formed with the metallic paint of the present invention has much better metallic impression (brightness) than that with the prior metallic pigments and affords glittering even by light other than sunlight. The glass flake pigment coated with nickel and the like generates almost no deposit in the paint because its specific gravity is about 3.

Silver coating coated on the glass flakes displays silvery

brightness, and similarly nickel coating shows darkish brightness. As shown in the present invention, the dual layer composed of both pigments displays grayish tone, and can be finished to medium tone color excellent in brightness.

In order to afford excellent brightness with nickel alone, since the coating has to be done with an amount of 2 or 3 times over that of silver coating, there is a fear that nickel readily aggregates and deteriorates stability of dispersion. Formation of the dual layer with both metals decreased the amount of nickel to be coated and improved the stability of dispersion. Moreover, though silver *per se* is chemically active, the coating of silver with nickel reduces the activity of silver to improve the stability in the present invention.

The present invention will be explained specifically by the following examples. In these examples, part and % indicate part by weight and % by weight, respectively.

Example 1

Metallic paint: Styrene 15%, methyl methacrylate 15%, butyl methacrylate 40%, 2-ethylhexyl acrylate 13%, hydroxyethyl methacrylate 15% and acrylic acid 2% were copolymerized with a polymerization initiator azobisisobutyronitrile in xylene to give an acrylic resin solution AC-1, which had heating residue of 50%, solution acid value of 80, and solution viscosity of Y (Gardner, 25°C).

Using this acrylic resin solution AC-1, metallic paint

was prepared in the following composition.

Metallic paint / Pigment	Example 1
50% AC-1	140 parts
60% Melamine formaldehyde resin (Note 1)	50 parts
Pigment prepared by plating glass flake particles with silver and then with nickel (Note 2)	2 parts
Carbon black (Note 3)	2.5 parts

Note 1: Mitusi Toatsu Chemicals, Inc.; trade name: Uban28SE

Note 2: Nippon Sheet Glass Co., Ltd.; trade name: Metashine RCFSX-2015PN (1022) (Glass flakes: mean thickness 2 ± 1μ; long axis 15 ± 5μ; silver plating 0.05μ in thickness; nickel plating 0.1μ in thickness)

Note 3: Cabott Corporation (USA): trade name: Carbon Black BP-1300

The above respective components were mixed, dispersed, and then adjusted its viscosity to 14 seconds (Ford cup #4/20°C) with a mixed solvent consisting of 35 parts of ethyl acetate, 35 parts of toluene, 10 parts of isobutanol and 20 parts of Swazol 1000 (Maruzen Oil Co., Ltd.).

Comparative Examples 1 - 2

Two different types of metallic paint for comparison were prepared in the following compositions in the same manner as in Example 1.

Pigment \ Metallic paint	Comparative Example	
	1	2
50% AC-1	140 parts	140 parts
60% Melamine formaldehyde resin (Note 1)	50 parts	50 parts
Crystalline particles of α-iron oxide (Note 4)	2 parts	0 part
Aluminum powder (Note 5)	0 part	2 parts
Carbon Black (Note 3)	2.5 parts	2.5 parts

Note 4: Sparklon 1500X (Product of Teika Co.)

Note 5: Product of Toyo Aluminium K.K.; Alpaste 7640NS

Example 2 and Comparative Examples 3 - 4

Metallic painting: A cationic electrodeposition paint of epoxypolyamine type was electrodeposited on a dull copper plate of 0.8 mm in thickness, which had chemically been treated with zinc phosphate, so as to form about 20μ of cured paint film. This was baked at 160°C for 30 minutes, ground with sandpaper of #400, and wiped with petroleum benzine to remove oil. Then, a second painting surfacer for car was spray-coated thereto to form about 25μ of cured paint film. This was baked at 140°C for 30 minutes, wet-rubbed with sandpaper of #400, and dried to remove water. This was then wiped with petroleum benzine to remove oil, and used as a test material.

On the above paint film, metallic paint prepared in Example 1 and Comparative Examples 1 and 2 was coated with an air-spray gun (Iwata Toso-ki, K.K.; Wider #71) to form 15 - 20μ of cured paint film, and allowed to stand at ordinary temperature for 5 minutes. Then, thermally hardened melamine resin/acryl resin

clear paint was air-sprayed thereon to form 35 - 40μ of cured film. This was allowed to stand at ordinary temperature for 10 minutes, and thermally cured in an electric hot air drier at 140°C for 30 minutes to form a metallic paint film (Example 2 and Comparative Examples 3 and 4).

The metallic paint films obtained in Examples and Comparative Examples were observed to confirm the effects. As a result, it was found that the paint film obtained in Example 2 displayed peculiar brightness in direct sunshine much better than that of aluminum or iron oxide, and the brightness scarcely faded in the shade. The brightening impression of the metallic paint film obtained in Example 2 is almost the same in all of angles including high-light, and the luster is likely to be inlaid with diamonds on the surface or in the inside of the paint film. It is a three-dimensional color impression of medium tone.

On the other hand, the paint films obtained with iron oxide or aluminum in Comparative Examples 3 and 4 are worse in a brightening impression when compared with that obtained in Example 2. They are poor in design.